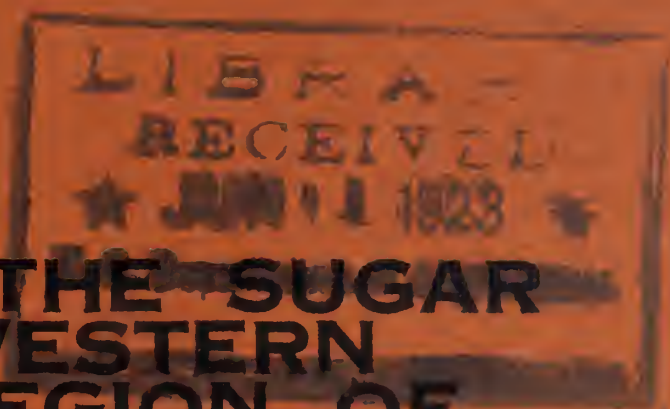


Historic, Archive Document

**Do not assume content reflects current
scientific knowledge, policies, or practices.**

1.9
P 69 Btc.



**THE RIBES OF THE SUGAR
PINE AND WESTERN
WHITE PINE REGION OF
CALIFORNIA**

By

STEPHEN N. WYCKOFF

* * * * *

**RUSTS OCCURRING ON
RIBES IN THE WEST**

BY

ELLSWORTH BETHEL

May 15, 1923

**THE RIBES OF THE SUGAR
PINE AND WESTERN
WHITE PINE REGION OF
CALIFORNIA**

By

STEPHEN N. WYCKOFF

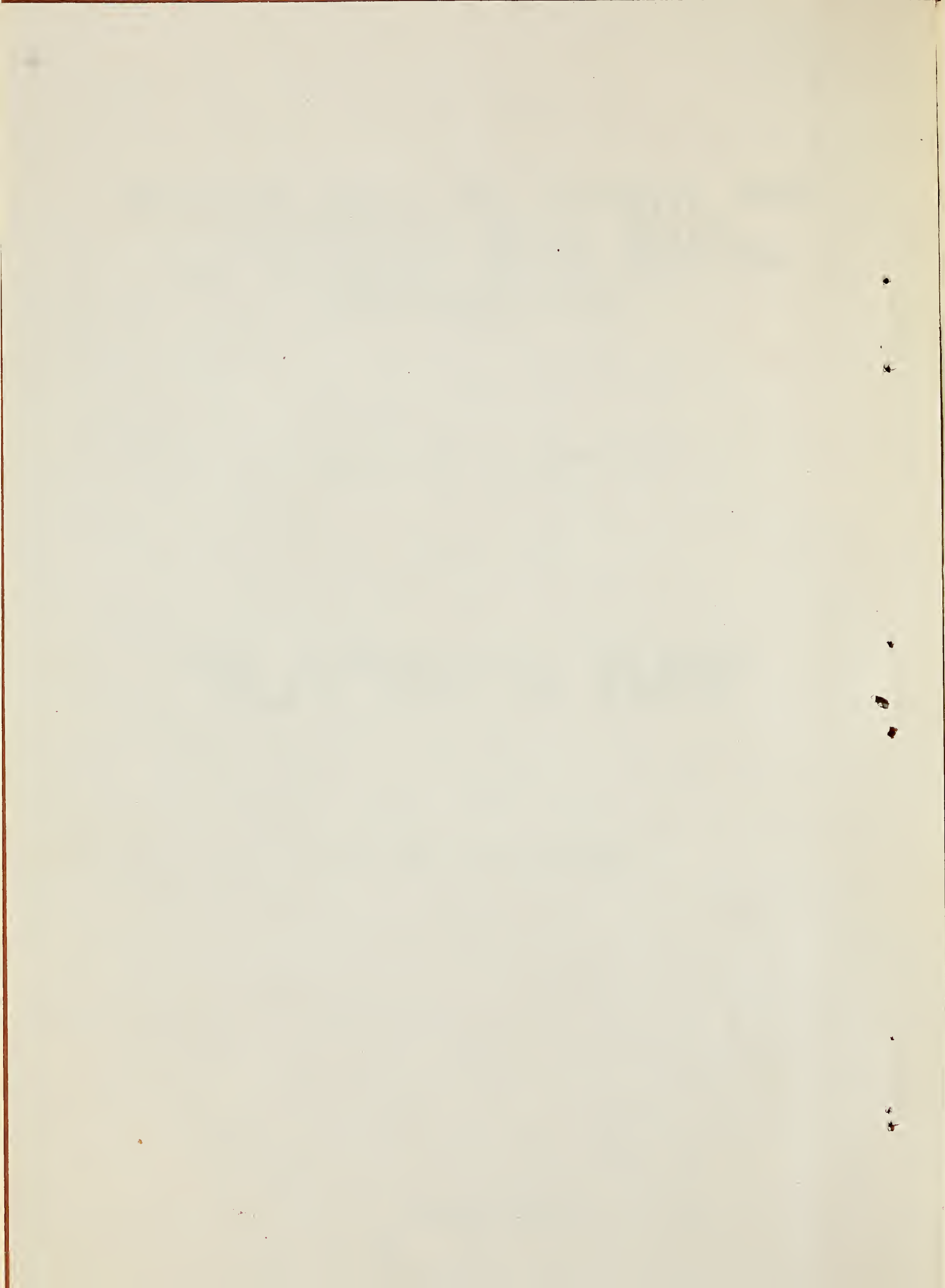
* * * * *

**RUSTS OCCURRING ON
RIBES IN THE WEST**

BY

ELLSWORTH BETHEL

May 15, 1923



THE RIBES OF THE SUGAR PINE AND WESTERN
WHITE PINE REGION OF CALIFORNIA.

By Stephen N. Wyckoff, Pathologist,
Office of Blister Rust Control,
Bureau of Plant Industry,
United States Department of Agriculture.

The keys and descriptions of the Ribes and the rusts on Ribes which are given here are intended for the use of blister rust men working in the sugar pine and western white pine region of California. For the present purpose this region is considered as comprising a broad strip running down the Sierra Nevada, covering both the east and west slopes, from Mt. Shasta at the north to the Tehachapi Mountains at the south. Both sugar pine and western white pine occur in the mountainous region to the north and west of Mt. Shasta. This region, however, while containing most of the Ribes species in this booklet, also has several species which quite typically occur in Oregon. For this reason, the booklet on the Ribes of Oregon will be found more suitable for the area represented by the Siskiyou, Scott, Salmon, and Trinity Mountains. For the Ribes of the sugar pine region of southern California, and for the groups of sugar pines in the Coast Ranges, the various local floras should be consulted.

Sugar pine (Pinus lambertiana) occurs in a broad belt on the west slope of the Sierra Nevada through the entire length of this range, and on the east slope in a few localities. This belt consists of the area lying mainly between 2000 and 7500 feet elevation in the northern Sierra Nevada, and between 4500 and 9000 feet elevation in the southern part of the range. This species practically never occurs as a pure stand, but is mixed with yellow pine (Pinus ponderosa), incense cedar (Librocedrus decurrens)

Douglas fir (Pseudotsuga taxifolia), white fir (Abies concolor), and in the higher part of its range with Jeffrey pine (Pinus jeffreyi) and red fir (Abies magnifica). It is also a common associate of the big tree (Sequoia gigantea) in the groves of this species.

Western white pine (Pinus monticola) also occurs throughout the entire length of the Sierra Nevada. In general, it is to be found in a belt lying altitudinally just above the sugar pine belt. This belt is comprised of the area between 6000 and 8000 feet elevation in the north and between 8000 and 10,000 feet elevation in the south. It is to be expected on both the east and west slopes, at these altitudes, and will be found associated with Douglas fir, red fir, lodgepole pine (Pinus contorta), and mountain hemlock (Tsuga mertensiana).

There are four other species of white pines growing in California, white-bark pine (Pinus albicaulis), limber pine (P. flexilis), foxtail pine (P. balfouriana) and bristle-cone pine (P. aristata). White-bark pine and foxtail pine are timberline trees. Their altitudinal range is higher than that of western white pine. White-bark pine is generally distributed at timberline through the entire length of the Sierra Nevada. Foxtail pine is of very limited distribution, occurring only in extreme northern California and at a few points in the southern Sierra Nevada. Limber pine and bristle-cone pine are quite widely distributed in the Rocky Mountains, and occur at a few points in California. They are found at high altitudes and under dry conditions, in the White, Inyo, and Panamint Ranges, east of the Sierra Nevada. Limber pine also occurs at a number of points on the east slope of the Sierra Nevada.

The species of Ribes which are listed here are

all commonly associated with sugar pine or western white pine on the west slope of the Sierra Nevada with the exception of *Ribes aureum* and *Grossularia velutina*. Although of wide distribution in other states, or other parts of California, these species occur only on the east slope of the Sierra Nevada, in this region. They are included, as certain types of blister rust work may be necessary there.

Until a few years ago currants and gooseberries were both included in the genus *Ribes* under the family Saxifragaceae. But according to our present knowledge of botanical relationships the old genus *Ribes* is considered as the family Grossulariaceae, and is divided into two genera; *Ribes*, or currants, and *Grossularia*, or gooseberries. For the sake of convenience and brevity, the term *Ribes* is still used in blister rust work to designate both currants and gooseberries collectively. Used in this looser sense the term *Ribes* is synonymous with the family name of Grossulariaceae.

The Grossulariaceae, or currants and gooseberries, are shrubs varying in height from 1 1/2 to 10 feet. A majority of the species have nearly erect stems, while a few grow prostrate on the ground or have their stems rising obliquely. All of the gooseberries and two of the currants have strong, sharp spines at the nodes, or joints of the stems and branches, and often have more numerous but weaker bristles between the nodes. The leaves are always alternate, that is, there is never more than one leaf twig or cluster starting from one place on a stem. The leaves are palmately veined, that is, with several large veins starting from the base of the leaf, and are more or less palmately lobed, or divided. In addition to the lobes, or larger divisions, the margins are more or less finely cut into teeth.

Either or both of the leaf surfaces and also the fruit may bear certain appendages which are of importance in distinguishing between the various species. These appendages are:

1. HAIRS (pubescence). These are practically always whitish in color and may be sparse or dense, coarse or fine, and straight or curled.

2. STALKED GLANDS. These are rather like very stout hairs except that they bear a small round knob at the tip. They vary greatly in size and in the length of the stalk. The color of the stalked glands also often varies with the age of the leaf or fruit on which they are borne.

The fruit are borne several to many in a slender cluster which may stand erect or droop. This form of cluster (raceme) consists of a central or common fruit-stalk (peduncle or rachis) from which small individual fruit-stalks (pedicels) arise, each of which bears a single fruit. Ribes fruit are round or sometimes oval, and vary considerably in size and color. They may bear hairs, or stalked glands, similar in form to those found on the leaves. In certain species they are also covered with a whitish powdery substance, known as the bloom. The flowers are persistent, that is, they remain in a withered condition at the tip of the fruit. These persistent flowers may be small, open, and spreading directly from the fruit, or they may be tubular, with the lobes spreading above the tube.

It is customary to think of gooseberry plants as being spiny, and currant plants as being spineless. This distinction, however, will not always hold. *R. montigenum*, a common species in the western white pine belt, is a currant that is very spiny, while *G. inermis*, a typical gooseberry, has only a few very inconspicuous spines. In such cases as these, it is only by an examination of the flowers or fruit that the true rela-

tionship of the plant can be determined.

The location of the joint at which the fruit breaks off from the common fruit-stalk provides a sure means of distinguishing between currants and gooseberries. If ripe gooseberry fruits are picked, or if the old fruits are found on the ground beneath the bush, they almost invariably have the individual fruit-stalk attached to the fruit. That is, the joint or break, naturally occurs between the individual fruit-stalk and the common fruit-stalk, and not between the individual fruit-stalk and the fruit. On the other hand, if currant fruits are picked, or found on the ground, they very rarely have the individual fruit-stalks still attached. In this case the break naturally occurs between the individual fruit-stalk and the fruit.

KEY TO THE RIBES OF THE SUGAR PINE AND WESTERN WHITE PINE REGION OF CALIFORNIA.

- I. Plants without spines on the stems and branches.
 - A. Leaves without stalked glands, sometimes hairy.
 1. Fruit smooth, without stalked glands, generally yellow or reddish; but occasionally black. Plants of the arid region of extreme northern California or the east slopes of the Sierra Nevada..... 1. R. aureum.
 2. Fruit bearing short stalked glands, blue-black with a whitish bloom. Plants of the sugar pine forests, generally growing in the shade and near moisture..... 2. R. nevadense.

B. Leaves bearing stalked glands at least on the lower surfaces and generally on the upper, also frequently hairy.

1. Fruit red, Leaves not more than 1 1/2 inches wide, very slightly lobed. Plants of very general distribution in the upper sugar pine forests and in the range of the western white pine.....3. R. cereum.
2. Fruit black, with or without a whitish bloom. Leaves not exceeding 3 inches in width, more deeply lobed. Plants of the western white pine and upper sugar pine belts, often growing on dry but shaded slopes....4. R. viscosissimum.

II. Plants bearing spines on the stems and branches.

A. Fruit glandular, prickly, or hairy.

1. Fruit glandular or hairy, or both, but never prickly.

- a. Fruit red, not hairy, sparsely covered with long, weak-stalked glands. Plants of the western white pine belt, occasionally found in the uppermost part of the sugar pine belt.

.....5. R. montigenum.

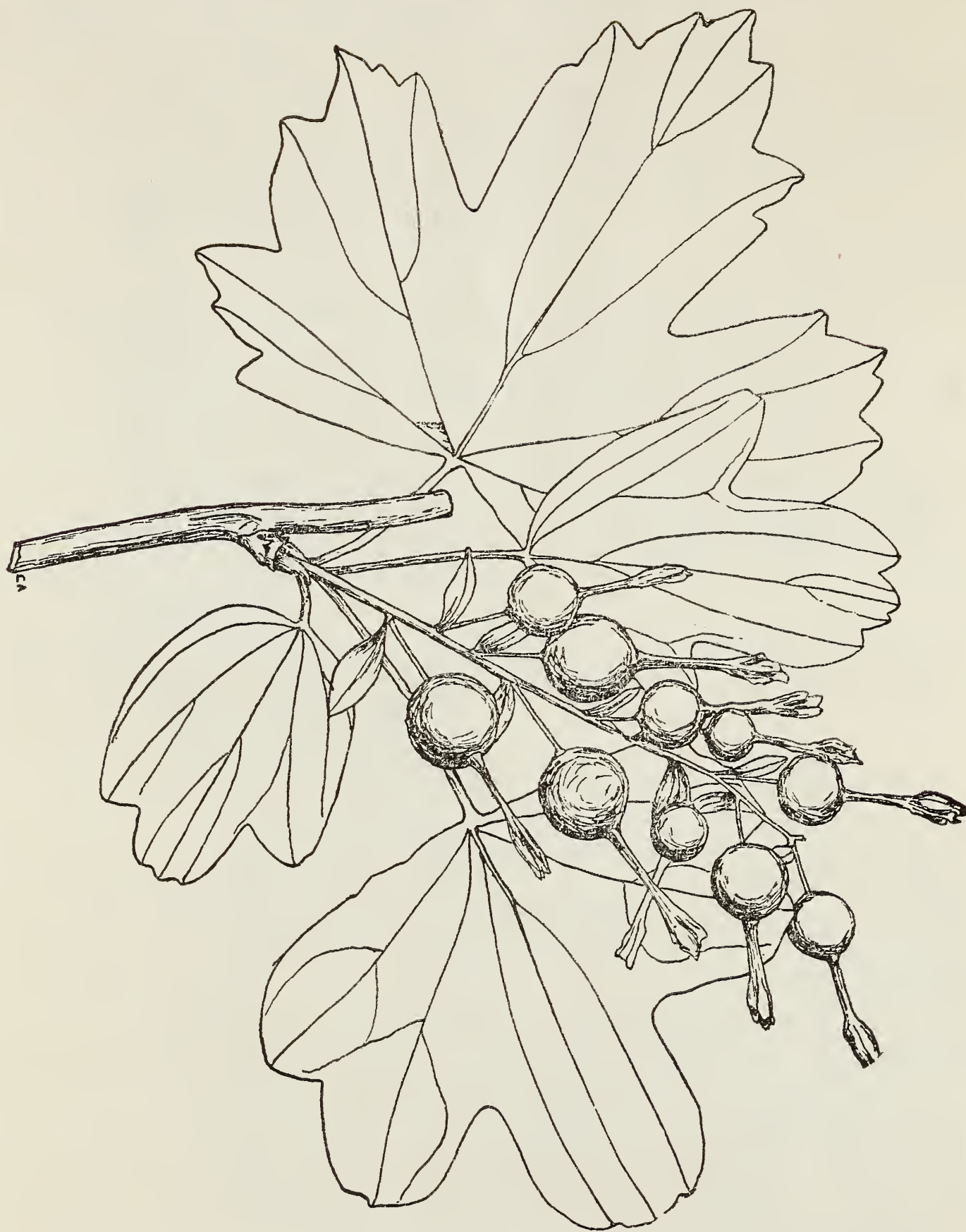
- b. Fruit yellow to brownish-purple, hairy and sometimes densely glandular. Plants of arid places in extreme northern California, and on the east slope of the Sierra Nevada.....

.....6. G. velutina.

2. Fruit densely covered with sharp prickles, brown to purple. Plants of general distribution in the forests of the Sierra Nevada.....7. G. roezli.



6-a



Ribes aureum Pursh
(Nat. size)

B. Fruit smooth, without hairs, glands or prickles.

1. Mature leaves not exceeding $3/4$ of an inch in width, generally less, bearing stalked glands, with or without hairs. Plants of high altitudes in the Sierra Nevada, found only in the western white pine belt.....8. G. lasiantha.
2. Mature leaves at least 1 inch in width, generally more, glandless, occasionally hairy. Plants of general distribution in the Sierra Nevada, growing in moist places.....9. G. inermis.

1. RIBES AUREUM PURSH.
Yellow Flowering Currant.

Height 3 to 7 feet. Habit erect. Leaves not exceeding 2 inches in width, wedge-shaped at the base, 3-lobed, and only as wide as long, or straight across to slightly heart-shaped at the base, 5-lobed, and much wider than long, with all gradations between these two shapes, both surfaces devoid of glands or hairs. Fruit-clusters rather short, 5 to 15-fruited, at least the longer ones drooping. Fruit smooth, generally deep yellow, sometimes reddish or black. Flowers long, tubular, yellow, sometimes tinged with red.

Note: Distinguish *R. aureum* from *R. nevadense* by the absence of whitish bloom and of stalked glands on the fruit.

HABITAT AND DISTRIBUTION. *R. aureum*, although of general western distribution, will be found in this region only in the lower, drier parts, east of the Sierra Nevada summit. While growing in arid regions, it will generally be found in moist soil, often in the shade.

2. RIBES NEVADENSE KELLOGG.
Sierra Nevada Currant.

Height 3 to 5 feet. Habit erect. Leaves seldom exceeding 1 1/2 inches in width, straight across to slightly heart-shaped at the base, much darker green above than below, hairless, or sometimes hairy, and occasionally bearing flat, colorless glands without stalks on the lower surface. Fruit-clusters erect or drooping, the 6 to 12 fruit borne on the upper half of the stalk. Fruit black, usually covered with a whitish bloom, and bearing at least a few stalked glands. Flowers red, or deep pink, rather shortly tubular.

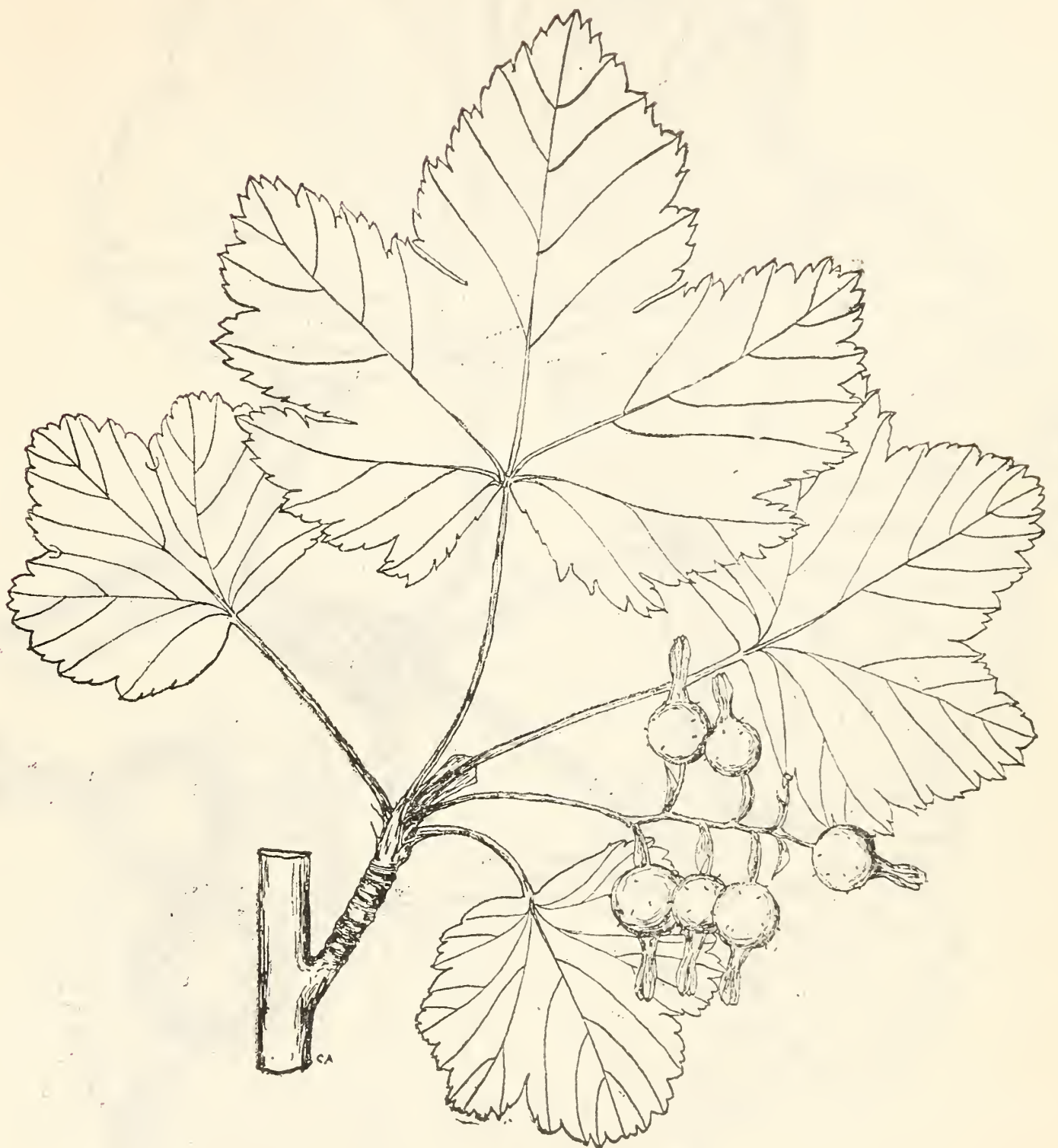
Note: Distinguish *R. nevadense* from *R. aureum* by the presence of the whitish bloom and the stalked glands on the fruit, and from *R. viscosissimum* by the absence of large stalked glands on both leaf surfaces. It is readily distinguished from *R. cereum* by the color of the fruit.

HABITAT AND DISTRIBUTION. *R. nevadense* is widely distributed through the sugar pine and western white pine belts of California. It is a shade and moisture-loving plant, generally growing near small streams, in moist but well-drained soils.

3. RIBES CEREUM DOUGL.
Squaw Currant.

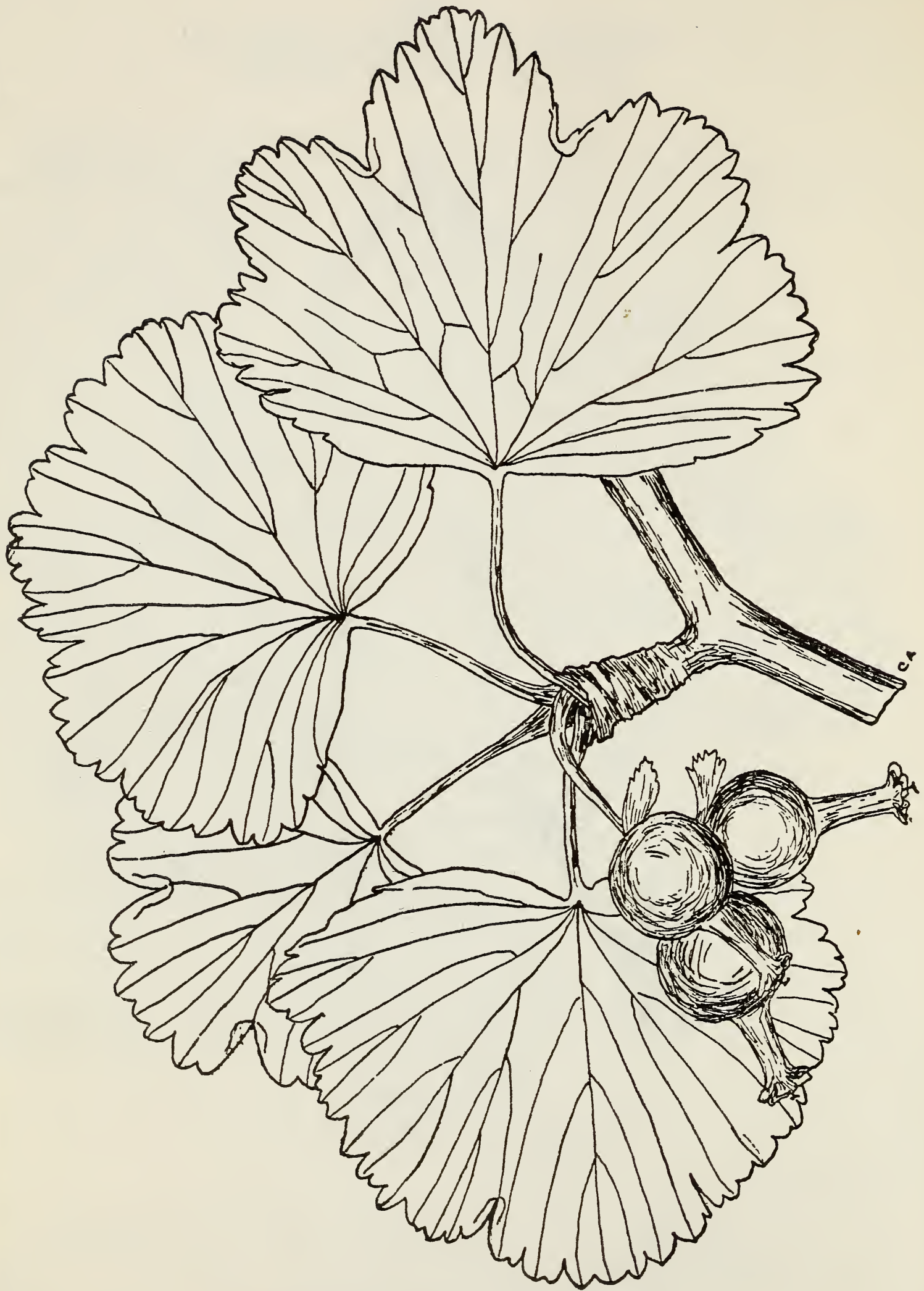
Height seldom exceeding 5 feet. Habit erect, compact, much branched. Leaves grayish-green, not exceeding 1 1/2 inches in width, generally much less, usually broader than long, very shallowly 3- or 5-lobed, the lobes rounded and finely toothed, finely glandular, sometimes sticky, and often finely

8-a



Ribes nevadense Kellogg
(Nat. size)

8-b



Ribes cereum Dougl.
(2 X Nat. size)



Ribes viscosissimum Pursh
(5/6 Nat. size)

hairy on both surfaces. Fruit-clusters short, drooping, bearing few fruits. Fruits red, smooth or sometimes glandular. Flowers white to pink, narrowly tubular, long, hairy.

Note: *R. cereum* can readily be distinguished from the other spineless currants by its red fruit.

HABITAT AND DISTRIBUTION. *R. cereum* is very common throughout the upper half of the sugar pine belt and in the western white pine belt. It is capable of growth in very dry rocky soils.

4. RIBES VISCOSISSIMUM PURSH.

Sticky Currant.

Height seldom exceeding 5 feet. Habit erect but often spreading. Leaves not exceeding 3 inches in width, round, generally 5- but sometimes only 3-lobed, the lobes broad, upper surface dark green, generally sparsely hairy, and bearing coarse stalked glands, lower surface more hairy than the upper and similarly glandular. Fruit-clusters quite short, drooping, bearing 3 to 6, or occasionally 8 fruit. Fruit black without bloom, oval rather than round, glandular or smooth. Flowers very light green, occasionally with a purplish tinge, broadly tubular.

Note: Distinguish *R. viscosissimum* from *R. nevadense* by the presence of stalked glands on the leaves, and from *R. cereum* by the color of the fruit.

HABITAT AND DISTRIBUTION. *R. viscosissimum* is generally distributed in the upper sugar pine and western white pine belts. It is generally found in at least half shade and on rather dry soils.

5. RIBES MONTIGENUM McCLATCHIE
Alpine Prickly Currant.

Height not exceeding 3 feet. Habit straggling. Spines 1 to 6 at the nodes, occasionally bristly between the nodes. Leaves small, not exceeding 1 1/2 inches in width and generally less, very deeply 5-lobed, the margins cut into larger teeth and these in turn cut into smaller, sharp teeth, both surfaces bearing hairs and stalked glands. Fruit-clusters loose, drooping, bearing 3 to 7 fruit. Fruit, red, bearing long, weak-stalked glands. Flowers small, whitish to reddish, saucer-shaped.

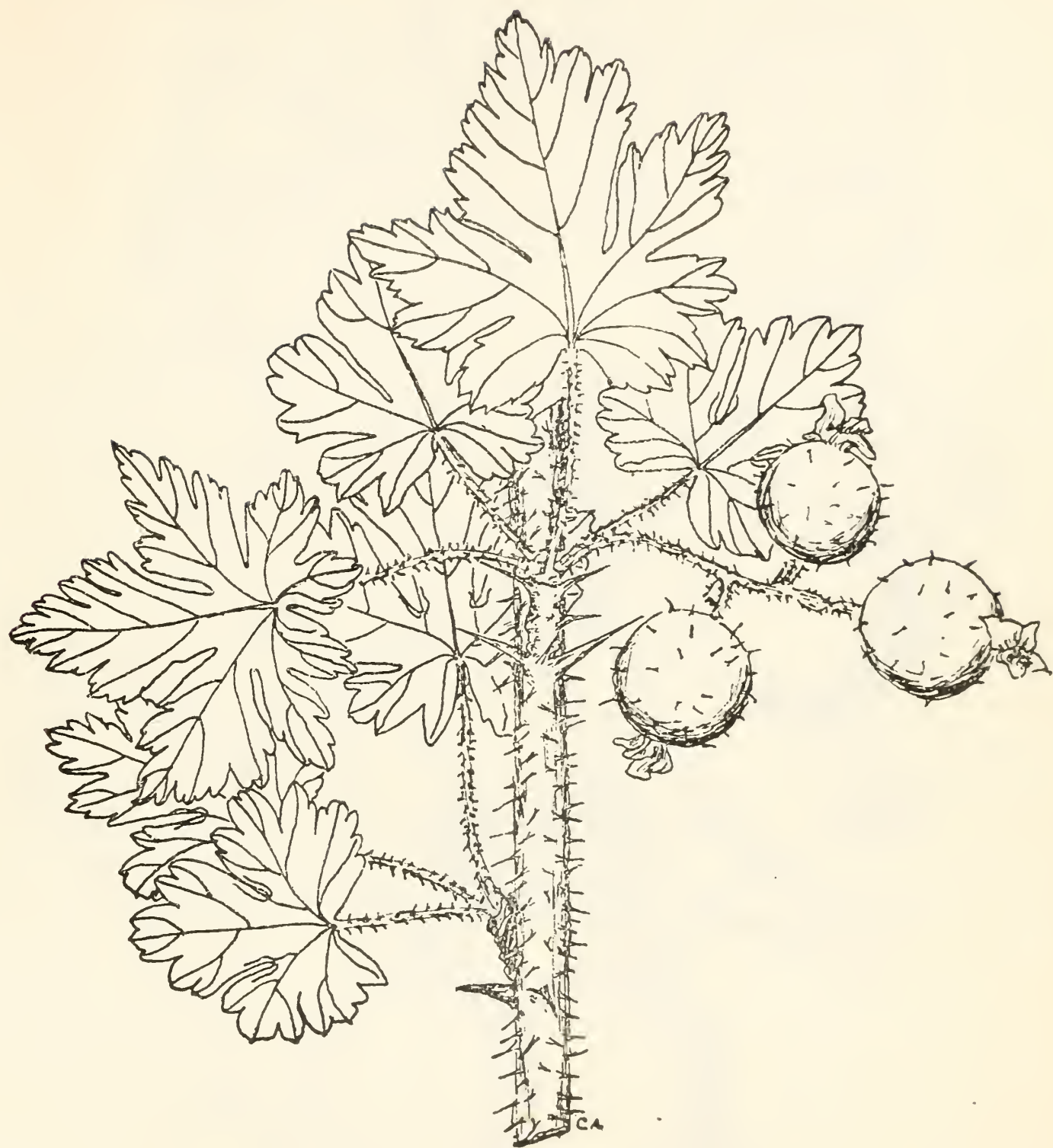
Note: Distinguish *R. montigenum* from *G. velutina* by the color of the fruit, and from *G. roezli* by the absence of spines on the fruit.

HABITAT AND DISTRIBUTION. *R. montigenum* is largely confined to the western white pine belt, only occasionally extending down into the upper part of the sugar pine belt.

6. GROSSULARIA VELUTINA (GREENE) COVILLE & BRITTON.
Desert Gooseberry.

Height not exceeding 4 1/2 feet, generally less. Habit, stems erect, branches recurved, forming a rounded, compact shrub. Spines occurring only at the nodes, as long as the leaves, stiff, sharp, yellowish, generally single on the young shoots, often triple on the older wood. Leaves grayish-green, small, seldom more than 1/2 inch wide, 3-5-lobed, each lobe cut into 2 or 3 smaller divisions, heart-shaped or straight across at the base, both surfaces hairy and often bearing stalked glands. Fruit-clusters short, drooping, bearing 1 or 2 fruit. Fruit yellowish to brownish-purple, hairy and occasionally densely covered with long stalked glands.

10-a



Ribes montigenum McClatchie
(2 X Nat. size)

SYLLABARY



Grossularia velutina (Greene)
Coville & Britton
(3 X Nat. size)

10-c



Grossularia roezli (Regel)
Coville & Britton
(1 1/5 X Nat. size)

10-c

Flowers yellowish, shortly tubular, hairy.

Note: Distinguish *G. velutina* from *R. montigenum* by the color of the fruit, and by the test as given on p. 3, to distinguish currants from gooseberries. Distinguish it from *G. roezli* by the absence of sharp spines on the fruit. In general appearance, *G. velutina* more closely resembles *G. lasiantha* than any other species. This latter species, however, has no hairs or glands on the fruit.

HABITAT AND DISTRIBUTION. *G. velutina* is a plant of the arid regions. It will be found on the east slope of the Sierra Nevada, and in the dry regions of northeastern California.

7. *GROSSULARIA ROEZLI* (REGEL) COVILLE & BRITTON
Prickly-Fruited Gooseberry

Height not exceeding 4 1/2 feet. Habit, stems erect from the ground, tending to droop. Spines occurring only at the nodes, generally 3 at a node, brownish. Leaves deep green in color, seldom more than 1 inch wide, generally somewhat less, 3-5 lobed, straight across or slightly wedge-shaped at the base, smooth to densely hairy on both surfaces. Fruit-clusters drooping, bearing 1 to 2 fruit. Fruit brown or deep purple, covered with long, sharp spines, larger than in the other gooseberries 1/2 to 1 inch in diameter. Flowers deep red or purplish, long, tubular, hairy or smooth.

Note: *G. roezli* is the only gooseberry in the sugar pine region having spines on the fruit.

HABITAT AND DISTRIBUTION. *G. roezli* is the most common. *Ribes* in the sugar pine region. It generally occurs in the open forests, in half shade, and may grow in quite dry soil.

8. GROSSULARIA LASIANTHA (GREENE) COVILLE & BRITTON

Height 3 feet or less. Habit, spreading, intricately branched. Spines occurring only at the nodes, single or triple. Leaves $1/2$ to $3/4$ of an inch in width, 3-5-lobed, heart-shaped to wedge-shaped at the base, generally hairy on both surfaces, and glandular. Fruit-clusters drooping, bearing 1 to 3 fruit. Fruit reddish, without hairs or glands, quite small. Flowers yellow, hairy, narrowly tubular.

Note: Distinguish *G. lasiantha* from *G. velutina* by the absence of hairs and glands on the fruit, from *G. roezli* by the absence of spines on the fruit, and from *G. inermis* by the size of the leaves and the presence of glands on the leaves.

HABITAT AND DISTRIBUTION. *G. lasiantha* is a species of limited distribution, occurring only at quite high altitudes, mostly above the range of sugar pine.

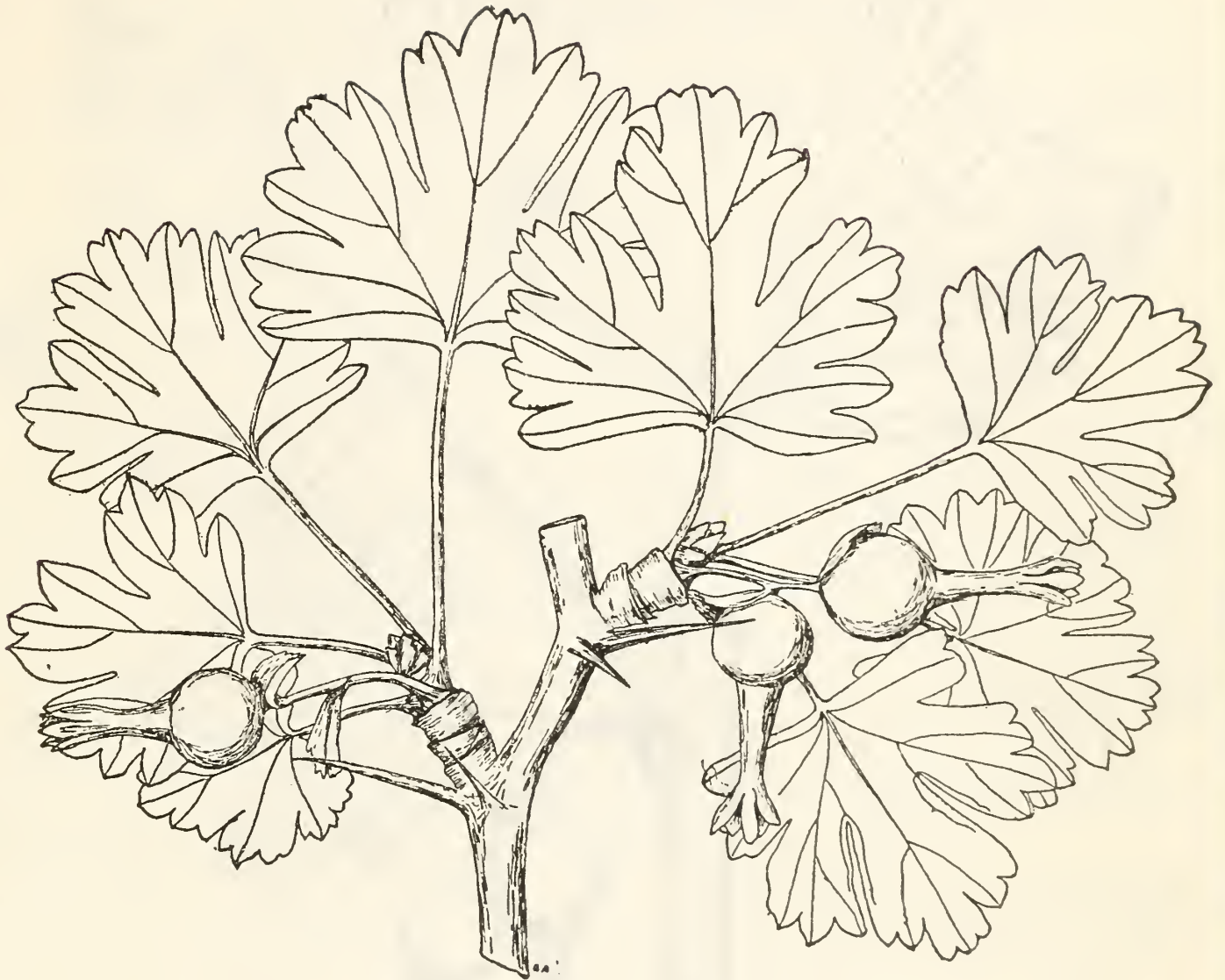
9. GROSSULARIA INERMIS (RYDB.) COVILLE & BRITTON

White-Stemmed Gooseberry.

Height not exceeding 4 feet. Habit erect. Stems white or yellowish and devoid of hairs when young, the nodal spines often wanting at many of the nodes, only occasionally bristly between the nodes. Leaves seldom exceeding 2 inches in width, thin, straight across to slightly heart-shaped at the base, without glands, generally devoid of hairs but occasionally sparsely hairy. Fruit-clusters drooping bearing 1 to 4 fruit. Fruit black or deep purplish, smooth, devoid of hairs or glands. Flowers greenish-white sometimes tinged with purple, short-tubular, rather bell-shaped.

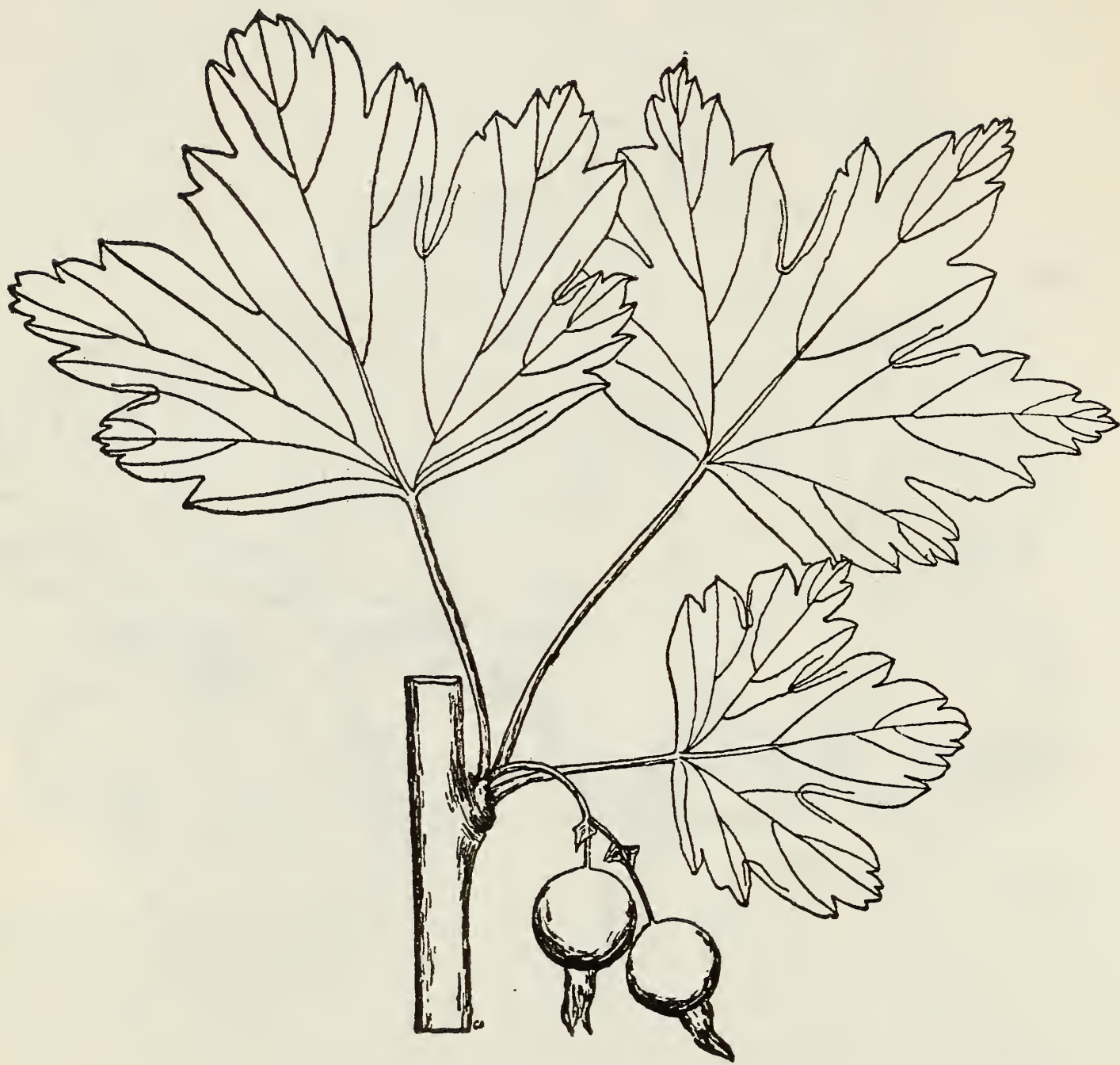
Note: Distinguish *G. inermis* from *G. lasiantha* by the absence of glands on the leaves.

12-a



Grossularia lasiantha (Greene)
Coville & Britton
(2 X Nat. size)

12-b



Grossularia inermis (Rydb.)
Coville & Britton
(1 1/3 X Nat. size)

HABITAT AND DISTRIBUTION. *G. inermis* is generally distributed through the Sierra Nevada, always growing in moist places. It will often be found to form large dense matted clumps among willows and alders, along small streams.

FLOWER KEY

- I. Plants without spines on the stems and branches.
 - A. Leaves without stalked glands, sometimes hairy.
 1. Flowers yellow, long, narrowly tubular. Plants of the arid region of extreme northern California, and the east slope of the Sierra Nevada.....1. *R. aureum*
 2. Flowers red or deep pink, short and rather broadly tubular. Plants of the sugar pine forests, generally growing in the shade and near moisture.....2. *R. nevadense*
 - B. Leaves bearing stalked glands at least on the lower surfaces, and generally on the upper, also frequently hairy.
 1. Flowers white to pink, narrowly tubular, leaves not more than 1 1/2 inches wide, very slightly lobed. Plants of very general distribution in the upper sugar pine forests and in the western white pine belt.....3. *R. cereum*
 2. Flowers greenish-white or tinged with purple, bell-shaped; leaves not exceeding 3 inches in width, more deeply lobed. Plants of the western white pine and upper sugar pine belts, often growing on dry but shaded slopes.....4. *R. viscosissimum*

II. Plants bearing spines on the stems and branches.

A. Flowers small, open and saucer-shaped, white to reddish, borne 4 to 8 in a long, loose cluster. Plants of the western white pine belt, occasionally found in the uppermost part of the sugar pine belt.....

.....5. R. montigenum.

B. Flowers tubular to bell-shaped, but never saucer-shaped, yellow, red, or greenish, borne 1 to 3 or occasionally 4, in a short cluster.

1. Flowers red or purplish, long, often hairy, the ovary covered with prickles, and often densely hairy. Plants of general distribution in the forests of Sierra Nevada.....7. G. roezli.

2. Flowers yellow, tubular, hairy.

a. Ovaries hairy and sometimes glandular. Plants of arid places in extreme northern California, and on the east slope of the Sierra Nevada.....

.....6. G. velutina.

b. Ovaries without hairs or glands. Plants of high altitudes in the Sierra Nevada, found only in the western white pine belt.....8. G. lasiantha.

3. Flowers greenish-white or slightly tinged with purple, small, inconspicuous, bell-shaped. Plants of general distribution in the Sierra Nevada, growing in moist places.....9. G. inermis.

RUSTS OCCURRING ON RIBES IN THE WEST.

By Ellsworth Bethel, Pathologist,
Office of Forest Pathology.

Ribes are attacked not only by white pine blister rust but by seven other rusts, which may be found in the West. It is desirable that persons interested in blister rust be able to distinguish these various rusts on Ribes.

Rusts are themselves plants, which grow as parasites on other plants. They grow within the tissues of the host plant, and at certain seasons send out to the surface of the leaf, stem, or fruit very small reproductive bodies known as spores. These spores occur in definite pustules known as sori (singular sorus). The sorus has a thin, membranous covering known as the peridium which later ruptures to free the spores. The color of a rust sorus is determined either by the color of the peridium or of the spores, and may be white, black, orange, red, or yellow. The sori often scarcely project beyond the surface of the leaf or stem, but in other cases appear as long cluster cups, or as telial horns as in white pine blister rust.

The sori, depending upon the type of spores produced, are termed pycnia (0), aecia (1), uredinia (II), and telia (III). There are also certain types of aecia recognized, as follows: an aecium whose peridium disappears early, leaving a naked pustule of spores is called a Caeoma (example, the aecial stage of *Melampsora confluens*). If the aecium is cup-shaped and the peridium toothed after breaking it is called an Aecidium. The name Peridermium is applied to certain rusts on conifers and closely related plants whose peridia split or break irregularly. Peridermiums may occur on either the leaves or stems and branches. In the first case they are termed

foliicolous, meaning leaf-inhabiting, and in the second caulicolous, or stem-inhabiting. Peridermiums occurring in the branches and trunks often give rise to large hypertrophies, or galls, or "Witches' Brooms". Foliicolous Peridermiums produce Coleosporium, while caulicolous species give rise to Cronartium.

Six of the rusts of Ribes are heteroecious, that is, they attack two hosts, with pycnia and aecia on one host and uredinia and telia on the other. The other two rusts are autoecious, that is, they occur on only one host, having telia only.

Aeciospores of these various rusts generally appear from the middle of April to the middle of June, though the time varies with the rust, the altitude, season, and climate. For example, the aecia of Melampsora confluens may not be evident east of the Cascades for a month or two after they have disappeared from the cooler, more humid coast region. The uredinia and telia of Coleosporium and Cronartium are not likely to be found in abundance before August or September or later.

The following is a key to the rusts on Ribes which are found in the Rocky Mountains and westward.

*Heteroecious rusts with all spore forms.

I. Pycnia and aecia on leaves of Ribes.

A. Aecia borne in cluster cups which are covered by the peridium until maturity.

1. Aecia short, broad, densely aggregated, yellowish to pale red.....

.....1. Puccinia Grossulariae.

2. Aecia long, slender, orange-red.....

.....2. Puccinia micrantha.

B. Aecia not borne in definite cluster cups, peridium disappearing early, forming naked pustules of the caeoma type.....

.....3. Melampsora confluens.

II. Uredinia and telia on leaves of Ribes.

- A. Peridium of the uredinial or telial pustule vanishing early. Uredinia appearing as large flat naked pustules, developing singly or in concentric rings, and becoming red and waxy in the telial stage.....

.....4. Coleosporium ribicola.

- B. Peridium of the uredinial pustule persistent, the spores liberated through a small opening.

1. Uredinia in irregular groups of small pustules; telia appearing later as hair-like horns, giving a fuzzy aspect to the under side of the leaf.

.....5. Cronartium ribicola.

The white pine blister rust.

2. Uredinia and telia as in Cronartium ribicola and scarcely distinguishable from it. However, in regions remote from the aecial hosts - pinyon pines - will probably be found on Ribes aureum only, and not usually evident until after the first of September.

.....6. Cronartium occidentale.

The pinyon blister rust.

** Autoecious rusts having only telia.

I. Telia on leaves of Ribes.

- A. Telia black, mostly hypophyllous, occurring only on Ribes lacustre.....

.....7. Puccinia Parkeriae.

- B. Telia, mostly epiphyllous, purplish or deep brown to black, occurring only on Ribes triste..

.....8. Puccinia Ribis.

Note: It is extremely difficult to distinguish *Cronartium ribicola* from *Cronartium occidentale*, in the uredinial or telial stage. Any *Cronartium* which is found on *Ribes* should be potentially regarded as white pine blister rust until proved otherwise. Any blister rust scout finding such a rust should immediately report it to the man in charge of his work. Specimens of all rusts on *Ribes* should be sent to the Office of Blister Rust Control, 429 Lyon Building, Seattle, Washington.

Life Cycles of the Rusts on *Ribes*.

1. *Puccinia Grossulariae*.
O and I on leaves of *Ribes*.
II and III on sedge (*Carex*).
2. *Puccinia micrantha*.
O and I on leaves of *Ribes*.
II and III on rice-grass (*Oryzopsis*).
3. *Melampsora confluens*.
O and I on leaves of *Ribes*.
II and III on leaves of willow (*Salix*).
4. *Coleosporium ribicola*.
O and I on needles of nut pines or pinyons.
II and III on leaves of *Ribes*.
5. *Cronartium ribicola*.
O and I on stems and branches of white (5-needled pines).
II and III on leaves of *Ribes*.
6. *Cronartium occidentale*.
O and I on stems and branches of pinyon or nut pines.
II and III on leaves of *Ribes*.

7. *Puccinia Parkeriae*.
III on leaves of *Ribes lacustre*.
8. *Puccinia Ribis*.
III on leaves of *Ribes triste*.

